



Design and analysis of the Wing-spread Bridge: a pedestrian bridge in the Binjiang Avenue, Shanghai

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Abstract

Along Binjiang Avenue, the landscape in Shanghai, China, a footbridge is needed to connect the two sides of the Qiantanyoucheng park. In this paper, the "Wing-spread Bridge" is designed and analyzed based on the environment and human requirements. The initial inspiration for this bridge comes from the stress ribbon structure. In the Wing-spread Bridge's structural design, the stress ribbon and arch are combined to reduce both components' horizontal force. Meanwhile, abutment, arch foot, and bridge tower are combined as one tower, and this tower is shaped like a dove according to the surrounding natural conditions. The combination and adjustment of the components make the structure beautiful and competitive in the landscape. Finally, this bridge's FE model is established, and the static is carried out based on it. The results show that the bridge can meet the specification requirements in static aspects.

Keywords: Stress ribbon, Arch bridge, Footbridge, Design, FEA.

1 Introduction

Binjiang Avenue in Shanghai is a riverside landscape project completed in 2017 with a total length of 45 kilometers. Integrating sightseeing, greening, transportation, and service facilities, Binjiang Avenue is like a ribbon floating on the Huangpu River's sides.

There are countless bridges along Binjiang Avenue. For example, long-span bridges include Yangpu Bridge, Xupu Bridge, and Lupu Bridge. Pedestrian bridges include Chuanyang River Bridge and Yangjing Port Bridge. It is a well-deserved

"Bridge Museum". There are over twenty bridges along the avenue. Various bridges on the riverside have witnessed Shanghai's vigorous development in the past three decades. The most common types of bridges built on Binjiang avenue are beam bridges, arch bridges, and cable-stayed bridges. We were expected to design a new type of bridge that has not been built on the river. So we designed a stress-ribbon arch bridge - "Wing-spread Bridge." The stress-ribbon arch bridge combines the characteristics of the stress-ribbon bridge and arch bridge. On the one hand, the bridge can connect Qiantanyoucheng Park to meet pedestrians and